



INSPECTOR GENERAL

U.S. Department of Defense

SEPTEMBER 16, 2015



Navy Officials Justified the MQ-4C Triton Procurement Quantity



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Results in Brief

Navy Officials Justified the MQ-4C Triton Procurement Quantity

September 16, 2015

Objective

This is the first in a series of audits on the Navy MQ-4C Triton (Triton) Unmanned Aircraft System (UAS) Program. Our overall objective for the series of audits was to determine whether the Navy effectively managed the Triton UAS acquisition program. For this audit, we determined whether the Navy adequately justified the overall Triton Unmanned Aircraft procurement quantity.

Finding

Navy officials justified the Triton planned procurement quantity of 70 aircraft. Specifically, Navy officials used prototype test results and engineering estimates to develop the planned procurement quantity.

The Navy plans to procure 70 Triton aircraft; 4 with Research, Development, Test, and Evaluation funds, and 66 with procurement funds. Triton program office officials stated that 68 aircraft are needed to meet key performance requirements at an estimated attrition rate of 4 aircraft per 100,000 flight hours. Specifically,

- The Navy will acquire four development aircraft using Research, Development, Test, and Evaluation funds. The first two are prototype aircraft, and will remain in use as test aircraft. The third and fourth test aircraft will be used for operational testing and transitioned to the fleet for mission use after testing.

Finding (cont'd)

- Triton program office officials stated that 20 primary mission aircraft are required to perform its mission at least 80-percent of the time at a 2,000 nautical mile mission range within 5 operational sites. Each of the five operational sites will operate four aircraft.
- The Triton attrition rate is based on Triton performance requirements and contractor engineering data. As of June 2015, contractor engineering data support the estimated attrition rate.

Office of the Chief of Naval Operations officials included the quantity of 70 aircraft in the development document that was submitted for Joint Requirements Oversight Council review and approval to support the initial production decision, in accordance with Chairman of the Joint Chiefs of Staff Instruction.

We are not making recommendations in this report. However, prior to the full rate production decision planned in FY 2018, it is important that Navy officials re-validate the accuracy of the engineering estimates after operational test data become available. Quantity requirements are considerations when planning a program, especially when considering affordability. Any quantity increase or decrease will have a significant cost impact on the program, which could make the program unaffordable.





**INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
4800 MARK CENTER DRIVE
ALEXANDRIA, VIRGINIA 22350-1500**

September 16, 2015

**MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION,
TECHNOLOGY, AND LOGISTICS
NAVAL INSPECTOR GENERAL**

**SUBJECT: Navy Officials Justified the MQ-4C Triton Procurement Quantity
(Report No. DODIG-2015-173)**

We are providing this report for your information and use. Navy officials justified the MQ-4C Triton planned procurement quantity of 70 aircraft. However, prior to the full rate production decision planned in FY 2018, it is important that Navy officials re-validate the accuracy of the engineering estimates after operational test data become available. We conducted this audit in accordance with generally accepted government auditing standards. We considered management comments on a discussion draft of this report in preparing the final and revised the report as appropriate.

We appreciate the courtesies extended to the staff. Please direct questions to me at (703) 604-9077 (DSN 664-9077).

Jacqueline L. Wicecarver
Jacqueline L. Wicecarver
Assistant Inspector General
Acquisition, Parts, and Inventory

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Acronyms and Abbreviations

Introduction

Objective

This is the first in a series of audits on the Navy MQ-4C Triton (Triton) Unmanned Aircraft System (UAS) Program. Our overall objective for the series of audits was to determine whether the Navy effectively managed the Triton acquisition program. For this audit, we determined whether the Navy adequately justified the overall Triton procurement quantity. We may perform additional audits on the Triton program in FY 2016.

Background

The Triton UAS will provide real-time intelligence, surveillance, and reconnaissance (ISR) over vast ocean and coastal regions. The aircraft is designed to fly up to 24 hours at a time, at altitudes higher than 10 miles and with a total range of 8,200 nautical miles. The Triton will provide intelligence information within a mission range of 2,000 nautical miles. The Triton will be equipped with sensors that provide a 360-degree view of its surroundings and will allow ships to be tracked over time by gathering information on their speed, location, and classification. The Triton is a variant of the Air Force Global Hawk, but offers a de-icing capability, a lightning protection system, and a reinforced airframe and wing structure. These features allow the aircraft to descend through cloud layers to gain a closer view of ships and other targets at sea. Figure 1 shows the Triton.



Figure 1. Triton UAS
Source: Triton program office

The Triton is a Navy Acquisition Category ID Major Defense Acquisition Program with the Under Secretary of Defense (USD) for Acquisition, Technology, and Logistics (AT&L) serving as the milestone decision authority. DoD guidance¹ describes Acquisition Category ID Major Defense Acquisition Programs as having estimated Research, Development, Test, and Evaluation (RDT&E) costs of more than \$480 million, or procurement costs of more than \$2.79 billion. The Triton's total life-cycle cost estimate² is projected to be approximately \$22.7 billion, including:

- \$3.5 billion in RDT&E costs,
- \$7.6 billion in procurement costs, and
- \$11.3 billion in operation and support costs.

The Triton entered the development phase on April 18, 2008. The purpose of the development phase is to verify that all requirements have been met and to support production or deployment decisions. The estimated initial production decision is scheduled for December 2015 and the full rate production decision is scheduled for March 2018. The initial production decision moves the program into the production and deployment phase. Table 1 shows the Triton's major program acquisition events.

Table 1. Triton's Major Program Acquisition Events

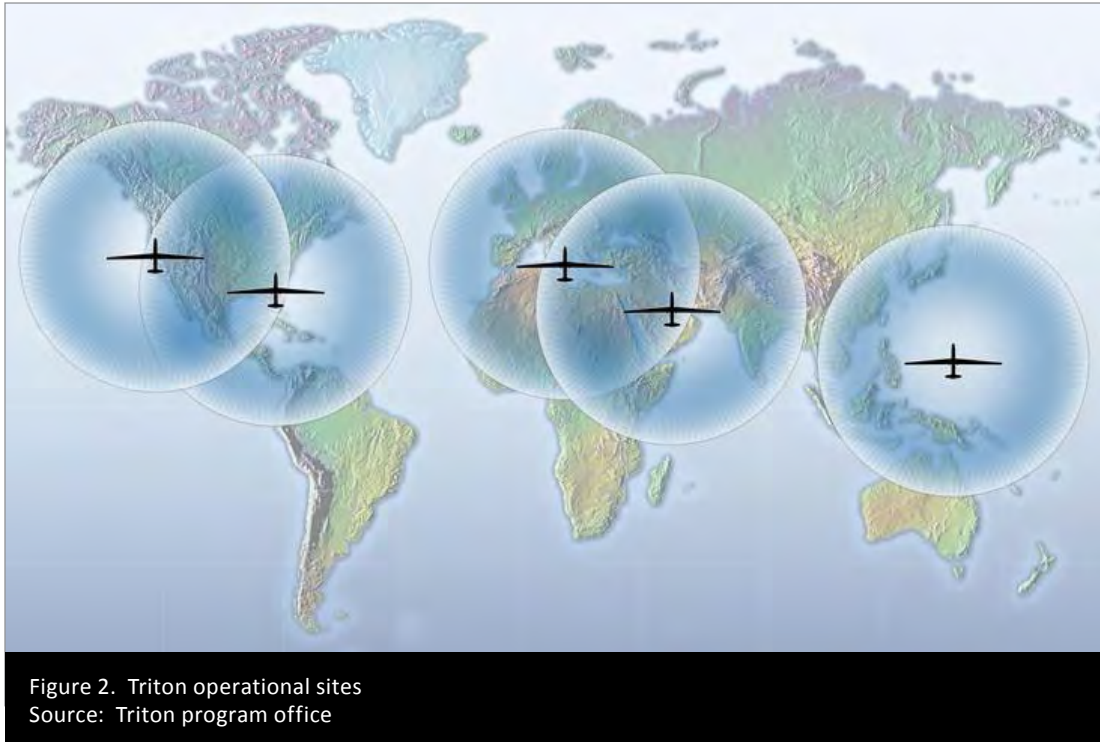
Program Acquisition Event	Date
Development Document Approval	May 2007
Development Decision	April 2008
Critical Design Review	February 2011
Estimated Initial Production Decision	December 2015
Estimated Full Rate Production Decision	March 2018
Estimated Initial Operational Capability	April 2018
Estimated Full Operational Capability	FY 2023

¹ DoD Instruction 5000.02, "Operation of the Defense Acquisition System," January 7, 2015.

² The cost estimate information was calculated in Base Year 2008 dollars and was obtained from the MQ-4C Triton Defense Acquisition Executive Summary report, dated August 25, 2015.

Triton Mission

The Triton is expected to provide continuous real-time ISR data collection over ocean and coastal regions. The Navy plans to establish five operational sites to provide worldwide ISR data collection. Figure 2 shows the planned Triton operational sites.



Each operational site requires four aircraft: three aircraft to perform the ISR mission and one additional aircraft for maintenance. The Navy plans to stand up one operational site every year beginning in FY 2018. Table 2 shows the Triton annual estimated procurement quantities.

Table 2. Triton Annual Estimated Procurement Quantities

Fiscal Year	2009	2013	2016	2017	2018	2019	2020	...*	2032	Total
RDT&E	2	2								4
Procurement			3	3	4	4	4	...	4	66
Total										70

* The annual estimated Triton procurement quantities between 2020 and 2032 are 4 aircraft per year.

Triton Analysis of Alternatives and Development Contract

In 2003, Navy officials analyzed different air vehicle and sensor options with the capability to provide continuous real-time ISR data collection over ocean and coastal regions to gain an understanding of the performance, costs, and risks associated with each of the alternatives. The analysis identified solutions that fell into three categories: the Global Hawk, Predator B, and business jet (Gulfstream G550 and Boeing 737). Navy officials' analyses found that no alternative dominated in categories of cost, risk, and performance. Therefore, the Office of the Assistant Secretary of the Navy, Research, Development, and Acquisition issued a memorandum in March 2004, directing a full and open competition for the Triton development contract.

The Navy awarded a \$1.16 billion cost-plus-award-fee contract to Northrop Grumman in April 2008 for the Triton development phase. The contract award was based on a best value source selection after a full and open competition.

Review of Internal Controls

DoD Instruction 5010.40, "Managers' Internal Control Program Procedures," May 30, 2013, requires DoD organizations to implement a comprehensive system of internal controls that provides reasonable assurance that programs are operating as intended and to evaluate the effectiveness of the controls. Naval Air Systems Command internal controls over Triton quantity requirements were effective as they applied to the audit objectives, because Navy officials justified the Triton planned procurement quantity using prototype test results and engineering estimates. We will provide a copy of this report to the senior official(s) responsible for internal controls.

Finding

Triton Procurement Quantity Justified

Navy officials justified the Triton planned procurement quantity of 70 aircraft using prototype test results and engineering estimates. Additionally, Office of the Chief of Naval Operations (OPNAV) officials included the 70 aircraft in the development document that was submitted for Joint Requirements Oversight Council (JROC) review and approval supporting the initial production decision, estimated for December 2015. However, prior to the full rate production decision planned in FY 2018, it is important that Navy officials re-validate the accuracy of the engineering estimates after operational test data become available.

Triton Procurement Quantities

The Navy plans to procure 70 Triton aircraft; 4 with RDT&E funds and 66 with procurement funds. Triton program office officials stated 68 aircraft are needed to meet key performance requirements at an estimated attrition rate of 4 aircraft per 100,000 flight hours and they provided prototype test results and engineering estimates to support their assessment.

Development and Test Aircraft

The Navy will acquire four development aircraft using RDT&E funds. Two of the aircraft are prototype, test aircraft and will remain test aircraft. These aircraft were delivered to the Triton program office in 2012 and are being used to mature sensor software and for developmental testing. The third and fourth test aircraft will be production representatives that will be used for operational testing in a user environment. These aircraft are scheduled for delivery in September 2016 and February 2017.³ According to program officials, at the completion of operational testing, the production representative aircraft will transition to the fleet for mission use.

³ The delivery information was obtained from the MQ-4C Triton Defense Acquisition Executive Summary report, dated August 25, 2015.

Mission Aircraft

Triton program office officials stated that 20 mission aircraft are needed to meet the Triton capability requirement. The Triton must be able to perform its mission⁴ at least 80-percent of the time at a 2,000 nautical mile mission range at 5 operational sites. To support the Triton capability requirement, each of the five operational sites will operate four aircraft. Specifically:

- three aircraft are required to perform the ISR mission, and
- one additional aircraft is required to maintain operational capability when an aircraft is undergoing maintenance.

The Triton system specifications require that a maximum of three aircraft be in the air simultaneously to meet its mission capability requirement. This requirement was competed and evaluated during a full and open competition for the Triton development contract, awarded in April 2008. As of July 2015, contractor engineering data support that the contractor is meeting the 80-percent mission requirement.

Attrition Aircraft

The Triton attrition rate is based on the Triton system specifications. System specifications set the maximum aircraft attrition rate at 4 per 100,000 flight hours and the goal attrition rate at 1 per 100,000 flight hours. Triton program officials stated that contractor engineering data estimated the attrition rate at 3.8 aircraft per 100,000 flight hours, which supports the required maximum attrition rate. Program officials also stated that formal test data does not yet exist to confirm these estimates; however, as of June 2015, the program began formal testing for aircraft reliability. Further, program officials stated that consistent test data to verify the actual attrition rate will not be available until the program logs

approximately 100,000 flight hours. The program office estimates the Triton will not log 100,000 flight hours until FY 2021, three years after the planned FY 2018 full rate production decision. Any inaccurate engineering estimates, including attrition rate, identified during testing affect the planned procurement quantity and could result in an increase or decrease in total aircraft procured.

Any inaccurate engineering estimates, including attrition rate, identified during testing affect the planned procurement quantity...

⁴ The amount of time a Triton spends performing its mission is a measurement called effective time on station. Effective time on station is defined as the actual time an aircraft is in a system mission capable status at up to 2,000 nautical miles (mission range) divided by the scheduled period of coverage (expressed as a percentage).

Triton Capability Requirements Document

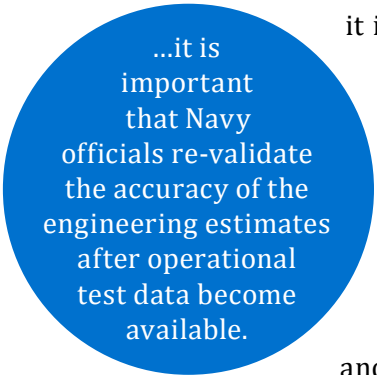
OPNAV officials followed the Joint Capabilities Integration and Development System process of validating quantity requirements of 70 Triton aircraft. Joint Chiefs of Staff Guidance⁵ provides a framework for the process of identifying, validating, and prioritizing capability needs. Capability needs must be detailed in the production document and validated before the program begins production. The production document describes the actual performance of the primary system as well as the quantity necessary to provide the capability to the warfighter.

OPNAV officials included the planned procurement quantity of 70 aircraft in the development document which will support the initial production decision. The initial production document was submitted to JROC for review and approval. During a meeting with JROC officials, we confirmed that the planned procurement quantity was included in the initial submission of the development document. OPNAV officials stated that they are updating the Triton development document for the initial production decision rather than creating a new capability production document because there are no changes to the Triton key performance requirements. According to Joint Capabilities Integration and Development System guidance, the development document may be amended in place of a production document to support initial production decisions as long as the changes do not adversely affect the acquisition of the previously validated capability increments.

JROC officials provided an overview of their processes for reviewing and validating the development document. JROC officials stated that they evaluate whether the program can accomplish its stated mission, but do not typically validate or analyze the quantity included in the development document. According to JROC officials, the USD (AT&L) performs analysis to evaluate quantity as part of the acquisition process. JROC officials stated that they work with the USD (AT&L) to monitor quantity, and if quantity changes occur, then the JROC assesses whether to review the capability requirements documents again.

⁵ Chairman of the Joint Chiefs of Staff Instruction 3170.01H, "Joint Capabilities Integration and Development System," January 19, 2012.

Re-evaluating Procurement Quantity in the Future



...it is important that Navy officials re-validate the accuracy of the engineering estimates after operational test data become available.

Prior to the full rate production decision planned in FY 2018, it is important that Navy officials re-validate the accuracy of the engineering estimates after operational test data become available. As of July 2015, test results are not available to verify all engineering estimates that impact procurement quantities. The Triton program office has an operational assessment planned for the fourth quarter FY 2015 that will support the initial production decision. The assessment includes simulation and flight events to determine the Triton's operational effectiveness and suitability risks. The simulation and flight event tests use the same scenarios, which will allow officials to validate the simulation results with actual flight data. Following the operational assessment, the initial operational test and evaluation phase will begin. Initial operational test and evaluation will use production representative aircraft and systems which will not be delivered until FY 2017, approximately one year after the initial production decision is scheduled to occur. During initial operational test and evaluation, the Commander, Operational Test and Evaluation Force, will independently evaluate the Triton's effectiveness and suitability, as well as the system readiness for fleet introduction.

Triton system performance will have an effect on procurement quantity. The Triton is expected to operate with an attrition rate of 4 aircraft per 100,000 flight hours. Engineering estimates support that the Triton can achieve the required attrition rate; however, test results do not yet exist to verify the system performance. If the Triton does not perform as expected, the procurement quantity could increase.

Quantity requirements are necessary factors to consider when planning a program, especially when considering affordability. DoD guidance⁶ places strict constraints on affordability, including requiring affordability caps that are fixed-cost equivalent to key program requirements. Any quantity increase or decrease will significantly impact program cost, which could breach these caps and make the program unaffordable. Generally, any increase in quantity will cause an increase in program total life-cycle cost and a quantity decrease will result in an increased average procurement unit cost, both of which are affordability constraints.

⁶ DoD Instruction 5000.02, "Operation of the Defense Acquisition System," January 7, 2015.

Appendix

Scope and Methodology

We conducted this performance audit from November 2014 through August 2015 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. We suspended the audit from December 2014 through April 2015 due to priorities related to contingency operations.

We collected, reviewed, and analyzed documents dated from September 2002 through August 2015. We reviewed and analyzed acquisition documents and engineering estimates to determine whether the Navy adequately justified the overall Triton UAS planned procurement quantity. We also analyzed the Navy's support for the planned primary mission aircraft, training aircraft, developmental/testing aircraft, backup aircraft, and attrition aircraft inventory quantities.

We visited the Triton program office located in Patuxent River, MD to understand how the Navy developed the overall Triton procurement quantity.

In addition, we interviewed officials from:

- Office of the Assistant Secretary of the Navy for Research, Development and Acquisition;
- Office of the Chief of Naval Operations; and
- Joint Requirement Oversight Council.

We also reviewed the following DoD and Federal guidelines:

- Chairman of the Joint Chiefs of Staff Instruction 3170.01H, "Joint Capabilities Integration and Development System," January 10, 2012;
- Joint Capabilities Integration and Development System Manual, "Manual for the Operation of the JCIDS," February 2015;
- DoD Instruction 5000.02, "Operation of the Defense Acquisition System," January 7, 2015; and
- "Manufacturing Readiness Level Deskbook," October 2012.

Use of Computer-Processed Data

We used computer-processed data to answer our audit objective. Triton program officials provided us a model used to predict Triton inventory and a model used to calculate the percentage of time that the Triton will perform its mission (effective time on station percentage). To assess the accuracy of the data, Triton program officials provided us an overall presentation of each model, including how each works and the inputs used in each model. Additionally, a system engineer from the Technical Assessment Division, DoD IG, determined that the effective time on station inputs were supported by test data and engineering estimates. Based on our verification, we concluded that the data provided by the Triton program officials was sufficiently reliable to accomplish our audit objective.

Use of Technical Assistance

A systems engineer from the Technical Assessment Division, Office of the Deputy Inspector General for Policy and Oversight, assisted with this audit. She accompanied the audit team to Patuxent River Naval Air Station and participated in the interviews. She reviewed Triton engineering estimates and provided observations on the supportability of the data provided.

Prior Coverage

During the last 5 years, the Government Accountability Office; the DoD IG; the House of Representatives, House Permanent Select Committee on Intelligence; and the USD (AT&L) issued 10 reports discussing the Triton. Unrestricted GAO reports can be accessed at <http://www.gao.gov>. Unrestricted DoD IG reports can be accessed at <http://www.dodig.mil/pubs/index.cfm>.

GAO

GAO Report No. GAO-15-99SU, "Triton Unmanned Aircraft System – Navy Needs to Make a Business Case for Its New Acquisition Strategy," December 2014

GAO Report No. GAO-14-340SP, "Defense Acquisitions – Assessments of Selected Weapon Programs," March 2014

GAO Report No. GAO-13-294SP, "Defense Acquisitions – Assessments of Selected Weapon Programs," March 2013

GAO Report No. GAO-12-400SP, "Defense Acquisitions – Assessments of Selected Weapon Programs," March 2012

GAO Report No. GAO-11-233SP, "Defense Acquisitions – Assessments of Selected Weapon Programs," March 2011

GAO Report No. GAO-10-508T, "Defense Acquisitions – DOD Could Achieve Greater Commonality and Efficiencies Among Its Unmanned Aircraft Systems," March 2010

DoD IG

DoDIG Report No. D-2011-028, "Contract Oversight for the Broad Area Maritime Surveillance Contract Needs Improvement," December 23, 2010

DoDIG Report No. D-2011-014, "Weaknesses in Awarding Fees for the Broad Area Maritime Surveillance Contract," November 2, 2010

House of Representatives

House Permanent Select Committee on Intelligence Report, "Performance Audit of Department of Defense Intelligence, Surveillance, and Reconnaissance," April 2012

Under Secretary of Defense for Acquisition, Technology, and Logistics

USD (AT&L) Report to Congress, "Future Unmanned Aircraft Systems Training, Operations, and Sustainability," April 2012

Acronyms and Abbreviations

AT&L	Acquisition, Technology, and Logistics
ISR	Intelligence, Surveillance, and Reconnaissance
JROC	Joint Requirements Oversight Council
OPNAV	Office of the Chief of Naval Operations
RDT&E	Research, Development, Test, and Evaluation
UAS	Unmanned Aircraft System
USD	Under Secretary of Defense

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U.S. DEPARTMENT OF DEFENSE

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